Opiate intoxication caused by epidural infusion of morphine: a case report of a near fatal medication error

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ABSTRACT

Introduction: Epidural infusion of local anesthetics with opioids is widely used for pain control during the perioperative - and peripartum period. Selection of the opioid, appropriate dosing and follow-up by the acute pain service (APS) are critical in providing safe postoperative epidural analgesia.

Case report summary: A 71-year old male was scheduled for a parastomal hernia repair with midline laparotomy. The parastomal hernia was a complication from a previously performed colectomy for ulcerative colitis. Preoperatively, the patient received a lower thoracic epidural catheter. The epidural infusate (0,2% ropivacaine with 0,5 mcg/mL sufentanil) was prepared and double checked by holding area nurses. The fact that the right prescription medication label partially covered a morphine label went unnoticed. The intraoperative phase was characterized by stable parameters. Postoperatively, it was not possible to demonstrate an epidural nerve block. No pain was reported, and the patient could be transferred to the ward. The patient developed coma and respiratory depression 9 hours after discharge to the postsurgical ward, requiring ICU admission and naloxone administration. Analysis of the syringe content revealed the presence of morphine (1 mg/mL).

Discussion: This case report shows that the double check policy is insufficient in preventing medication error. Color coded prefilled syringes combined with the use of an epidural specific syringe connector to prevent cross-connections should become standard practice.

INTRODUCTION

Epidural anesthesia is widely used for perioperative and peripartum pain control. Indications include open upper abdominal surgery, thoracotomy and labor analgesia. Risks versus possible benefits should be carefully balanced as epidural anesthesia can result in serious adverse events. In addition, alternative regional techniques (e.g. erector spinae plane block, peripheral nerve blocks, wound infiltration) are promising and may reduce the indications for epidural anesthesia.¹

Opioids are frequently used as local anesthetic adjuvant to extend the duration of sensory block and limit the required cumulative dose of local anesthetics.² Guidelines exist to reduce the incidence of neuraxial opioid-related respiratory depression or hypoxemia.^{3,4} Recommendations include identifying patients at risk for respiratory depression, preventing respiratory depression after neuraxial opioid administration (selection of opioid, dose and route of administration) and perioperative monitoring. This case report describes a near fatal medication error resulting in inadvertent epidural infusion of morphine.

CASE

A 71-year old male was scheduled for a parastomal hernia repair with midline laparotomy. He had a history of ulcerative colitis treated with colectomy and placement of an ileostomy several years ago. This surgical procedure was complicated by intestinal ischemia requiring a re-laparotomy and acute kidney injury followed by persistent impairment of renal function (moderate chronic kidney disease, stage 3A). Furthermore, he underwent a partial nephrectomy for renal cell carcinoma. He had no history of obesity or obstructive sleep apnea.

Preoperatively, a lower thoracic (T11-T12) epidural catheter was inserted using the median approach and the loss of resistance technique. This procedure was performed in the holding area. Lidocaine 1% at a dose of 60 mg was administered as a test dose and no signs of unintentional intrathecal placement were observed. Two holding area nurses prepared and double-checked the prescribed epidural medication (0,2% ropivacaine with 0,5 mcg/mL sufentanil). Importantly, the vials of morphine and ropivacaine combined with sufentanil are stored next to each other. The fact that the right prescription

medication label partially covered a morphine label went unnoticed (*Figure 1*). The patient was transferred to the operating theater and epidural infusion was started at a rate of 8 mL/hour. General anesthesia was started with the following induction agents: propofol, sufentanil and rocuronium. Anesthesia was maintained using sevoflurane for a period of 90 minutes. An epidural infusion bolus was administered following induction (10 mL) and the infusion rate was maintained at 8 mL/h. Hemodynamic – and respiratory parameters were stable during general anesthesia maintenance. No additional intravenous opioids were administered. The parastomal hernia repair was completed without adverse effects.

Figure 1. The right prescription medication label partially covered a morphine label went unnoticed

Postoperatively, the patient was monitored in the recovery room. No pain was reported while the epidural blockade could not be demonstrated using cold sensation. The patient was somnolent with a Glasgow Coma Score of 14 (E3M6V5). The Aldrete's scoring system was used before discharge and the patient was successfully transferred to the postsurgical ward.⁵ At this time, approximately 5 hours after start of the epidural infusion, the nurse of the postsurgical ward recognized the wrongly labeled syringe. The syringe was replaced by a different one containing ropivacaine 0,2% + sufentanil 0,5 mcg/mL. No other actions were initiated. The attending anesthesiologist was consulted by phone and

agreed with transfer to the postsurgical ward. This was probably the result of miscommunication about the nature of the incident.

Figure 2. Vital signs of the patient (The operating room and recovery room)

At the postsurgical ward, the patient was awake and vital signs were stable. After midnight (1:00 am), the patient was observed sleeping with a normal breathing pattern. At 3:00 am, the patient was seen snoring and had a cyanotic appearance. An oropharyngeal airway (Mayo-tube) was inserted and oxygen therapy was started using a non-rebreathing mask. Initial physical examination showed central cyanosis, hypopnea (6/min) and miosis. Vital signs included a peripheral saturation of 98% after oxygen therapy, blood pressure of 143 /80 mm Hg and a pulse rate of 89/min. The Glasgow Coma Score was 3 (E1M1V1). The blood glucose level was 8,3 mmol/L. Arterial blood gas analysis revealed a combined metabolic and respiratory acidosis with a pH of 7,06, a pCO2 of 6,4 kPa, bicarbonate of 13 mmol/L, base excess of - 16,5 mmol/L and a blood lactate of 13,2 mmol/L. The patient had an arterial oxygen saturation of 100% at a pO2 of 42,0 kPa after initiation of oxygen therapy. The patient was admitted to the Intensive Care Unit

(ICU). He received naloxone and could be successfully discharged to the postsurgical ward the following day. No mechanical ventilation was required during his treatment on the ICU. Two days later, the patient was successfully discharged from the hospital.

Analysis of the syringe contents revealed the presence of morphine (1 mg/mL)

DISCUSSION

This case report shows that the double check policy is insufficient in preventing medication error. The error resulted in opiate overdose requiring ICU admission and treatment with naloxone. Color coded prefilled syringes combined with the use of an epidural specific syringe connector to prevent cross-connections should become standard practice.

Epidural administered opioids produce analgesia by binding to opioid receptors present in the central – and peripheral nervous system. The pharmacokinetics after administration of epidural opioids is complex and involves the epidural space, cerebrospinal fluid and the circulatory system. Pharmacokinetic differences correlate with differences in physicochemical properties. Interestingly, the bioavailability in the epidural and intrathecal space is less for hydrophobic opioids compared to relatively hydrophilic opioids such as morphine. This is caused by sequestration in epidural fat and increased plasma clearance. In addition, morphine is characterized by slow intrathecal clearance; consistent with its relatively hydrophilic nature.^{6,7} After epidural administration of morphine, cerebrospinal fluid (CSF) concentrations peak in about 1 hour. Variable fractions of morphine remain for many hours in the CSF.⁸ Epidural analgesia with morphine is recommended with a continuous infusion of 200 – 400 mcg/h.⁹ The medication error described in this case report resulted in a continuous infusion that was 20 times higher the recommended upper infusion rate.

This error resulted from wrong drug labeling caused by human factors and a failure of the system to identify and correct it. Wrong drug labeling is an important cause of medication error. An Australian Incident Monitoring study showed that 20,8% (187 / 896 in the period of 1988 – 2001) of all drug error related incidents were caused by selection of the wrong ampoule or wrong drug labeling.¹⁰ Opiate intoxication caused by inadvertent epidural infusion has been described previously.¹¹ An important difference with this case

report, however, is the fact that labeling and preparing the syringes were done separately by different personnel.

The following safety improvements were implemented in our institution: the use of pre-filled syringes prepared by the hospital pharmacy, the use of a unique syringe connector for neuraxial and major regional anesthesia (“NRFit”) preventing wrong-route administration incidents and organizing lectures about medication safety. A review on obstetric neuraxial drug administration errors also recommended the use of non-Luer lock connectors on all neuraxial lines.^{12,13}

In conclusion, this case report shows a medication error caused by wrong drug labeling. Prefilled syringes combined with unique non-Luer lock connectors are recommended to prevent wrong-route administration incidents. In addition, training in crew-resource management principles should be mandatory for all operating room personnel to reduce the risk of miscommunication.

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